MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

PEM0016 – ALGEBRA

(Foundation in Engineering)

2 MARCH 2020
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **THREE (3) pages** including cover page with **FOUR (4) questions** only.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided. All necessary working **MUST** be shown.
4. Only **non-programmable** calculator is allowed.

QUESTION 1 [25 marks]

(a) Find all solution(s) for the following equations:

(i) $\sqrt{3x+1}-\sqrt{x-1}-2=0$ (4 marks)

(ii) $\frac{3x}{x-5}+2=\frac{15}{x-5}$ (3 marks)

(b) Find all solution(s) for the following inequalities:

(i) $2.5<\left|\frac{x+1.5}{4}\right|<3.5$ (9 marks)

(ii) $\frac{x-2}{x+3}\geq\frac{x+3}{x-2}$ (9 marks)

QUESTION 2 [25 marks]

The function $f(x)$ and its inverse $f^{-1}(x)$ are given as below:

$$f(x)=2x^3+4 \qquad\qquad f^{-1}(x)=\left(\frac{x-4}{2}\right)^{1/3}$$

Do the following:

(a) Verify that the given inverse function, $f^{-1}(x)$ is true for the given function $f(x)$. (3 marks)

(b) Find the domain of $f(x)$ and range of $f^{-1}(x)$. (3 marks)

(c) Determine $(f(x))^{-1}$. (1 mark)

(d) Determine whether $f(x)$ is even, odd or neither. (2 marks)

(e) Calculate $f(-1.392)$, $f(\sqrt[3]{-2})$, $f(0)$, $f^{-1}(-1.394)$, $f^{-1}(0)$ and $f^{-1}(4)$. (3 marks)

(f) Use transformation method to graph the function $f(x)$. Next, on the same axis, graph the inverse function, $f^{-1}(x)$ and include all the points calculated in (e). (10 marks)

(g) From the graph in (f), determine the range of $f(x)$ and domain of $f^{-1}(x)$. (3 marks)

Continued.....

QUESTION 3 [25 marks]

A certain polynomial is given as $g(x)=4x^4-24x^3+36x^2+16x-48$ which also can be expressed in the factorized form as $g(x)=4(x+1)(x-3)(x-2)^2$. Do the following:

(a) Use Synthetic Division to show that $(x-3)$ is one of the $g(x)$'s factor. (4 marks)

(b) Use Remainder Theorem to determine the remainder when the $g(x)$ is divided by $(x+1)$. Next, verify that $(x+1)$ is one of the $g(x)$'s factor. (3 marks)

(c) Use Long Division to show that $(x-2)^2$ is one of the $g(x)$'s factor. (6 marks)

(d) Find the $x-$ and $y-$intercepts of the function. Determine whether the graph crosses or touches the $x-$axis at each of $x-$intercept(s). (6 marks)

(e) Find the intervals on which the graph of the function is above and below the $x-$axis. (2 marks)

(f) Graph the function. Include the turning points which occur at $x=2.686$ and $x=-0.186$. (4 marks)

QUESTION 4 [25 marks]

Consider the following matrices:

$$A=\begin{bmatrix}2 & 0 & 0\\ 1 & -1 & 0\\ 1 & 2 & 3\end{bmatrix} \qquad B=\begin{bmatrix}-2 & 1 & 4\\ 0 & 3 & 1\\ 0 & 0 & 3\end{bmatrix}$$

Determine the value of x, y and z if $AB\begin{bmatrix}x\\ y\\ z\end{bmatrix}=\begin{bmatrix}2\\ -1\\ 2\end{bmatrix}$ using the following methods:

(a) Cramer's Rule (11 marks)

(b) Inverse matrix (14 marks)

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